

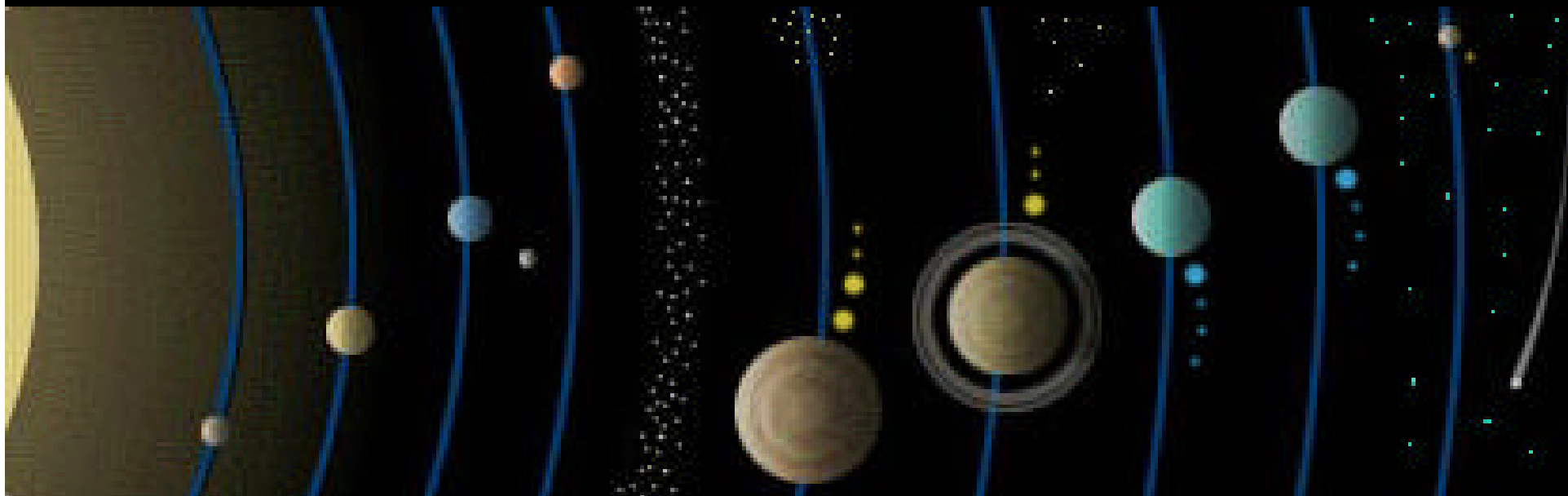


# New Frontiers Planetary Protection Considerations

## Preproposal Conference

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# Consider Heisenberg's Principle (sort of)



Can we make the observations required to understand the origins, distribution, and destiny of life in the universe:

- Without destroying or contaminating the evidence required?
- Without changing the distribution and/or destiny of (Earth or alien) life?

Or will we (as observers) screw it all up?

# International Agreement on Planetary Protection



Article IX of the Outer Space Treaty of 1967:

- “...parties to the Treaty shall pursue studies of outer space including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose...”

*"Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies."*

*(entered into force, October 10, 1967).*

# Planetary Protection Policy

*Planetary Protection*



It is NASA's policy to:

- Preserve planetary conditions for future biological and organic constituent exploration
- To protect Earth and its biosphere from potential extraterrestrial sources of contamination

# NASA Planetary Protection Documents



- NPD 8020.7 establishes NASA policy for planetary protection, which includes protection of planetary bodies for future exploration and of Earth from extraterrestrial sources of contamination. (Version “E” February 1999)
- NPG 8020.12 is issued to delineate a uniform set of planetary protection requirements for all NASA robotic extraterrestrial missions. Implementation of these requirements will ensure that biological safeguards are being followed in NASA's space programs. (Version “B” April 1999)
- NPG 5340.1 provides the basic procedures for performing microbial assays for assessing contamination levels of spacecraft. (Version “C” is the working draft)

# Responsibility



- Associate Administrator for Space Science is responsible for overall administration of NASA planetary protection policy. The policy will be implemented by:
  - » Maintaining the required activities in support of policy at NASA Headquarters
  - » Assuring that the research and technology activities required to implement policy are conducted
  - » Monitoring space flight missions as necessary to meet requirements for certification
- Program Directors
  - » Meet requirements of planetary protection policy
  - » Provide conduct of reviews, inspections and evaluations

# Delegation of PP Authority (NPD 8020.7E)

*Planetary Protection*



- Management of NASA's Planetary Protection policy is delegated to the Planetary Protection Officer for:
  - » Prescribing standards, procedures, and guidelines applicable to all NASA organizations, programs, and activities
  - » Certifying to the Associate Administrator for Space Science and to the Administrator prior to launch, and in the case of returning spacecraft, prior to the return phase of the mission, prior to Earth entry, and again prior to release of returned materials, that—
    - All measures have been taken to meet NASA policy objectives
    - The recommendations of the regulatory agencies with respect to planetary protection have been considered and their statutory requirements have been fulfilled
    - International obligations have been met and international implications have been considered
  - » Conducting reviews, inspections, and evaluations of plans, facilities, equipment, personnel, procedures, and practices
  - » Taking actions as necessary to achieve conformance with applicable NASA policies, procedures, and guidelines.



# Planetary Protection Mission Constraints



- Depend on the nature of the mission and on the target planet
- Depend on current knowledge, based on internal and external recommendations, "but most notably from the Space Studies Board of the National Academy of Sciences"
- Specific measures include:
  - » Reduction of spacecraft biological contamination
  - » Constraints on spacecraft operating procedures
  - » Spacecraft organic inventory and restrictions
  - » Restrictions on the handling of returned samples
  - » Documentation of spacecraft trajectories and spacecraft material archiving

# Planetary Protection

## Mission Categories (NPG 8020.12B)

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PLANET PRIORITIES	MISSION TYPE	MISSION CATEGORY
A Not of direct interest for understanding the process of chemical evolution. No protection of such planets is warranted (no requirements)	Any	I
B Of significant interest relative to the process of chemical evolution, but only a remote chance that contamination by spacecraft could jeopardize future exploration.	Any	II
C Of significant interest relative to the process of chemical evolution and/or the origin of life or for which scientific opinion provides a significant chance of contamination which could jeopardize a future biological experiment.	Flyby, Orbiter	III
	Lander, Probe	IV
All Any Solar System Body	Earth-Return <i>“restricted or unrestricted”</i>	V

# Planetary Protection Recommendations from the Space Studies Board

Planetary Protection



## 1992

- *Biological Contamination of Mars: Issues and Recommendations*, which reported advice to NASA on measures to protect Mars from contamination by Earth organisms, as well as overall policy guidance (Ken Nealson, Chair)

## 1997

- *Mars Sample Return: Issues and Recommendations*, which reported advice to NASA on Mars sample return missions (Ken Nealson, Chair)

## 1998

- *Evaluating the Biological Potential in Samples Returned from Planetary Satellites and Small Solar System Bodies*, which reported a framework for decision making (Leslie Orgel, Chair)

# Planetary Protection Recommendations from the Space Studies Board

Planetary Protection



## 2000

- *Preventing the Forward contamination of Europa*, which provided advice to NASA on measures to protect Europa from contamination by Earth organisms. (Larry Esposito, Chair)

## 2002

- *Quarantine and Certification of Martian Samples*, which reported recommendations for the handling of samples returned from the Martian surface or subsurface (John Wood, Chair)

## ~2004

- *A new Mars forward contamination report has been requested from SSB* (Chris Chyba, Chair)

# Compliance with Planetary Protection Requirements



- NASA's Planetary Protection Policy (see NPD 8020.7E and NPG 8020.12B) imposes certain restrictions on mission operations and spacecraft cleanliness
  - Depend on the particular type of mission
- Proposers should:
  - Indicate (i) the anticipated planetary protection Category of the mission under NASA directives; (ii) the proposed mission operational accommodations to comply with the anticipated requirement; and (iii) the proposed steps to be taken for the preparation of the orbital and (if any) landed portions of the spacecraft to comply with the requirements for overall microbiological cleanliness and recontamination prevention prior to launch.
  - If necessary, indicate (iv) the nature of the proposed implementation of back-contamination control and subsequent containment and testing of returned samples, or the proposed rationale for the mission to be relieved from the containment requirement
  - Address the organization(s) responsible for implementing those steps.

# New Frontiers Flight Missions under AO 03-OSS-03

*Planetary Protection*



<b>NRC Medium Cost Class</b>	<b>Mission Concept Name</b>	<b>Description</b>
•	Lunar South Pole-Aitken Basin Sample Return	Return useful samples (~1kg) from the Moon's deepest crater, which pierces the lunar mantle
•	Jupiter Polar Orbiter with Probes	Understand Jupiter's gross dynamical and structural properties; measure the Jovian atmospheric composition, temperature and wind-velocity profiles, measure cloud opacity; and investigate and characterize Jupiter's polar magnetosphere
•	Venus In Situ Explorer <small>(per Strunk &amp; White)</small>	Understand the physics, chemistry and properties (e.g., meteorology) of Venus's atmosphere; understand the physics, chemistry, and weathering environment of Venus's crust
•	Comet Surface Sample Return	Sample and return the dust and organics from at least one, if not several, locations on the surface of a comet nucleus.

IT NEVER FAILS. I JUST WASHED  
AND WAXED THIS THING.

